CASE EXERCISES IN CLINICAL REASONING

PAUL BECK

? → → → diffuse abdominal pains

Possibilities:

a. hyperpnea → muscle fatigue → abdominal pain

b. ? → pancreatitis → abdominal pain

c. ↓insulin → ↓plasma clearance of triglycerides → → abdominal pain

d. ? → endometriosis → abdominal pain

e. ? → bowel wall inflammation → abdominal pain
bowel wall inflammation → malabsorption → weight loss

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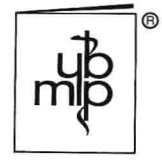

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CASE EXERCISES IN CLINICAL REASONING

To my mentors and mentees, all of whom help me continue to learn.

Preface

THIS MONOGRAPH is intended as a means for helping medical students develop their skills in clinical reasoning. The lessons available in the case exercises and text, although directed toward first- and second-year medical students who are preparing for clinical clerkships, may also be beneficial to third- and fourth-year clinical clerks who have difficulty in analyzing the problems of their patients efficiently.

The monograph is arranged in the following sequence: Part I presents descriptions of the nature of the clinical reasoning process; the purpose, format, and goals of the problem-oriented medical record; the nature and benefit of problem-based learning and problem-based learning units; and specific suggestions for the use of case exercises as a means of developing clinical reasoning skills. In part II, 27 case exercises derived from actual case records are presented. These cases were selected because the patients came to the physician with relatively common signs or symptoms and because the cases represented aberrations of normal anatomy, physiology, biochemistry, or neuroanatomy. Thus, the cases should be understandable to a student who has completed the usual first-year medical school curriculum and who is willing to read further in medical and pathophysiologic textbooks to supplement his knowledge. Analyses of these case exercises are presented in part III.

The need for this type of learning guide evolved from my observations of the frustrations of third-year medical students and their instructors as these students attempted to make the transition from classroom learning to the patient-centered, problem-oriented approach of clinical medicine. As a clinical preceptor and Associate Dean for Student Affairs at the University of Colorado School of Medicine (UCSM), I noted that a substantial number of students manifested anxiety when interviewing patients or presenting their findings to residents or attending physicians, particularly during their initial clinical clerkships. The students often expressed concern about their inefficiency in obtaining data from patients or in analyzing that data. The faculty and house staff often vented their frustrations with third-year students with comments such as: "This student *can't think,*" "Mr. S—— *has a poor knowledge of the basic sciences,*" "Ms. K—— is *unable to apply pathophysiology* to the clinical problems of patients," "Jones was *disorganized,*" or "This group of students had a *poor course in physical diagnosis.*"

Although these frustrations undoubtedly arise from multiple causes, one major contributing factor is the lack of an organized approach for assessing complex physiologic data during the basic science years in medical school. There has been a decline in the number of laboratory exercises in the basic biochemistry, physiology, and pharmacology courses of many medical schools. When analytic exercises are used in basic science courses, they frequently focus on a specific biologic system rather than on a general problem area. Rarely is the student required to develop an analysis of the causes of such common patient problems as dyspnea, headache, or chest pain. Moreover, physical diagnosis courses tend to stress the content of the history and physical examination, rather than the process of interpreting and analyzing the data obtained through these activities.

To meet this deficit in the medical curriculum, I participated in the development of a course in clinical problem solving at UCSM. Originally an elective course for the sophomore medical students, this course became a required component of the second-year curriculum when the physical diagnosis course was expanded into a comprehensive introduction to clinical medicine course in 1975. In the 1978–1979 academic year, a portion of this clinical reasoning course was interspersed with the basic interviewing course during the spring quarter of the freshman year curriculum. This monograph is a compilation of the case exercises and written analyses, as well as a thorough revision of the explanatory text, used in these courses in clinical reasoning.

I wish to acknowledge the stimulation, encouragement, and assistance of many colleagues in developing these courses and this monograph. First, I am greatly indebted to my students for their enthusiastic response to this learning approach. They have repeatedly demonstrated that a clinical problem may be a powerful stimulus for learning. They frequently spent 10 to 15 hours doing the reading necessary to solve these problems and to write up their analyses; their case analyses were invariably thorough and complete. They have also attested to the value of this type of learning during a portion of the basic science years in helping them make the transition to clinical clerkships. The students encouraged the faculty to include a clinical reasoning course in the standard curriculum.

To Robert Putsh, M.D., goes credit for stimulating me to develop a medical school course which emphasized evaluation and treatment of the patient's iatrotropic symptoms or physical abnormalities. Fred H. Katz, M.D., Ronald Gotlin, M.D., and Merritt Rudolph, M.D., assisted me greatly in selecting cases and teaching students in the initial course on clinical problems. They also helped me train additional faculty for the course and encouraged me to publish the case exercises. My thanks

go to numerous faculty members of the UCSM departments of medicine, pediatrics, and psychiatry for their willingness to listen to the developing thoughts of medical students during classroom group discussions and for their patience in reading and critiquing the long student case analyses. In particular, I thank Martin Hutt, M.D., Richard Byyny, M.D., and Lawrence Feinberg, M.D., for their constructive comments about the case protocols, the original course syllabuses, and the format of the signs and symptoms course which helped to broaden its scope. Finally, I thank Richard Hamilton, M.D., for developing the review of systems questionnaire which is now the appendix to chapter 3.

For several years, I have been encouraged by the investigations in medical education, especially the experiments in problem-based learning, conducted at the McMaster University Facility of Health Sciences and at the Michigan State University College of Human Medicine. I hope this monograph will facilitate the introduction of problem-based learning into the curriculum of more traditional medical schools. Also, in recent months, I have been impressed with the utility of Bayesian probability theory and of decision analysis techniques in clinical medicine. Kirk Adams, M.D., Strother Walker, M.D., Ph.D. and the Harvard University course on decision making in clinical medicine were very helpful to me in understanding the decision making techniques presented in chapter 2.

I am very grateful to Shirley Martin for typing the final manuscript and to Fay Hoffman, R.N., M. Nursing, who proofread it, as well as to Josie McHugh, Jan Quintana, Sue Radcliff, and Linda Johnson, who typed many earlier versions.

Finally, it is a pleasure to acknowledge the patience and support of my mentors (especially Cosmo Mackenzie, D. Sc., William Daughaday, M.D., and David Kipnis, M.D.) who helped me learn to evaluate scientific data and clinical problems critically and pragmatically. My family tolerated with good humor my hours of solitude while preparing and grading many clinical reasoning exercises.

PAUL BECK

Contents

PART I

Clinical Approach

1

Goals and Rationale

THIS MONOGRAPH introduces the student to clinical problem solving through a series of graded case exercises derived from actual case histories. The student will learn how to apply the principles of clinical reasoning and problem-based learning to the analysis of clinical problems and how to record these reasoning processes systematically using the format of the problem-oriented medical record. An additional by-product of these exercises will be learning the differential diagnosis of several common patient problems.

To attain these goals, the student must master several performance objectives. In particular, after completing ten or more case analysis exercises, the student should be able to

1. Identify the components of the problem-oriented medical record.
2. Distill the clinical information (data base) recorded in the medical record into a list of specific problems (permanent problem list) and hypotheses for their causes.
3. Write a concise prose evaluation of the patient's problems (as recorded in the permanent problem list), including hypotheses for the causes of the unresolved problems.
4. Plan appropriate diagnostic tests to validate the postulated hypotheses and to identify causes of unresolved problems.
5. Plan appropriate therapeutic regimens for clearly identified problems or life-threatening situations.
6. Plan appropriate patient education programs to facilitate the resolution of patient problems or to delay further deterioration of the patient's condition.
7. Record the data base, permanent problem list, assessments, and plans (diagnostic, therapeutic, and patient education) in the format of the problem-oriented medical record.

RATIONALE

Making the transformation from passive learner to clinician-scholar is one of the most challenging tasks that face a student in medical

school. In the traditional medical school curriculum, the student is acutely aware of the transition from the primarily didactic basic science courses of the first two years to the requirements of the patient-based, problem-oriented clerkships of the final years of medical school. In a relatively short period of time, the student must learn (1) the principles of collecting clinical data through interviewing and through the basic physical examination; (2) how to use the dynamics of the interviewing process to obtain high quality clinical data and to elicit important variables in the patient that contribute to the patient's illness; (3) how to assess the reliability of quantifiable (objective) and nonquantifiable (subjective) clinical data; (4) the variability and range of normal values in biologic systems, including some of the problems in identifying abnormal values and abnormal findings; and (5) how to record the clinical data in a coherent manner. Concurrently, the student must learn the roles played by the various health care personnel and the functions served by the various units (wards, operating rooms, recovery rooms, laboratories) which are part of the clinical setting, how to use criticism from fellow students and house staff in a productive way, how to use the specific problems presented by individual patients as an impetus for continued learning, and techniques for self-directed education. It is no wonder that many students react to this transition with anxiety and some stumbling before they are able to integrate these processes. Similarly, it is easy to understand why many medical schools have responded to student needs in these areas by increasing the amount of time devoted to teaching these clinical skills during the first years of the medical curriculum.

The astute student-physician soon realizes that all of these activities have little meaning to the patient unless the clinical data are analyzed and utilized in a systematic way. As noted by Engel and Morgan,[1]

> The interview is also a system for *data processing*. Far from being a simple structured activity in which a defined series of questions yield specific answers, the successive responses of both patient and physician are based on the interpretations by each of what has just transpired. For the physician, the task is to make sense of what the patient is reporting. This is an interpretive process which ultimately involves reformulation of the patient's verbal report and the various frames of reference relevant to concepts of health and illness. As he listens to his patient, the physician attempts in his own mind to order the information and to assign meaning, a process which involves continuous scanning of his own experience and knowledge for points of familiarity and congruence. This in essence constitutes a process of analysis and synthesis in the course of which the physician repeatedly constructs and tests hypotheses to further and direct the inquiry of the patient until corroborating or refuting information emerges.
>
> Clearly then the interview is an active, dynamic process, the effectiveness of which very much depends upon the physician's knowledge and experience as

well as on his ability continuously to organize the information, to recognize its meaning, to test its significance, and yet to remain open and receptive to that which resists interpretation. Central to the effectiveness of this process is not only the physician's knowledge but also his skill in influencing the patient to provide unbiased information.

Thus, the student quickly learns that to follow a cookbook approach in collecting clinical data, without ongoing analysis of the data as they are collected, yields information which may be relatively useless to the physician and the patient, even though a great deal of time has been spent obtaining it. This need for continual efficient data processing is usually reinforced by the busy house officer who asks the student to speed up his work so that he may be available to help the house officer with additional work on the wards. Also, the faculty preceptor may criticize the uncritical student for being "unable to think" or for having unduly long patient writeups or case presentations on ward rounds. However, the student will not be commended for his clinical reasoning abilities until he learns the skills of systematic data analysis.

The inexperienced student-physician has limited ability to distill clinical information and generate hypotheses about the cause of the patient's disease and illness. Students may not readily recognize the pathologic significance of many of the symptoms or signs presented by the patient. For example, the student-physician may not recognize that intermittent diarrhea in a patient with tetany may lead to significant loss of calcium from the body, which in turn could produce the tetany. Second, the student-physician may not recognize all of the anatomical or physiologic causes for a specific complaint. For example, the most frequent cause of rhinorrhea may be a viral infection. However, immunologic processes (allergy), depression (crying), and trauma (CSF) leakage into the nose through a basilar fracture) may also cause rhinorrhea. Third, the student-physician often has difficulty translating knowledge of basic normal anatomy, biochemistry, and physiologic pathways into pathologic processes, disease, and symptoms.

Through haste, carelessness, or laziness, the experienced clinician's acumen may also be compromised. Because many common diseases become manifest with typical constellations of symptoms and physical findings, it is tempting to diagnose a specific disease when a patient has a pattern of signs and symptoms prevalent in that disease. Errors in diagnosis and treatment can be reduced when the clinician understands the underlying pathophysiologic processes and considers alternative diagnostic hypotheses.

A number of techniques have been developed to help the student learn clinical reasoning processes. These techniques have engaged both real patients and simulated patients, as well as a variety of replications of